# NATURAL RESOURCES CONSERVATION SERVICE

# CONSERVATION PRACTICE STANDARD

## Composting Facility

**(Number)**

**Code 317**

**DEFINITION**

A facility for the biological stabilization of waste organic material.

**PURPOSES**

To biologically treat dead poultry, swine or other organic waste to prevent pollution of the environment and to destroy pathogenic organisms while producing a product which can be safely utilized for land application. It is not intended to provide a means for disposing of large numbers of animals due to catastrophic losses.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies where: (1) There is a predictable mortality rate associated with a poultry or swine production enterprise; (2) composing of dead animals complies with all state and local laws for dead animal disposal; (3) the composing facility is part of the waste management plan for the entire enterprise.

**CRITERIA**

**Federal, State and Local Laws.** All applicable federal, state and local laws must be adhered to for the disposal of dead animals.

**Configuration.** The dead animal composter shall be designed to facilitate turning of the compost material when the primary stage is complete and removal and/or storage of the compost when the entire process is complete. Sufficient bins shall be provided to allow proper loading, monitoring and turning of the composting material. The dimensions of the composting facility shall be dependent upon the species and size of animal, type of materials used to build the bins and the reach and size of the loading and unloading equipment. The height of the bins should be limited six feet to maintain good aeration of the compost pile. The width of the bin shall be dependent upon the size of animals and the loading and unloading equipment. A minimum of 6 inches of composting material shall be maintained between the carcasses and the sides of the bin.

In order to prevent runoff and control the moisture content of the compost, the facility must be under roof. Compost bins and high traffic areas used for loading and unloading compost shall have concrete floors to prevent seepage and to protect the area from rutting and erosion. The composting facility must be located about the 25 year flood plain. Additional design information is available in chapter 10 of the Agricultural Waste Management Field Handbook.

**Structural Design.** Structural design of the composting facility shall conform to the requirements of NRCS Standard 313, Waste Storage Structure. The facility must be designed to withstand impacts from equipment or allow

for replacement of damaged members. The materials must be able to withstand temperatures generated during the composting process and resist deterioration during the expected life of the structure.

**Temperature.** The temperature of the compost must be monitored to insure that the compost pile reaches a minimum of 135 $^{o}$F. The temperature probe must penetrate one third of the distance from the outside of the pile to the center of mass.

**Poultry.** The minimum volume required for the primary stage of dead poultry composting facilities shall be determined by the formula listed below. A volume equal to the primary stage will also be required for the second stage.

$V_{min} = (B)\ (W_B)\ (M)\ (C)\ (F)/100T$

Where:

| | |
|---|---|
| $V_{min}$ | = Minimum Volume ($ft^3$) |
| B | = Number of poultry |
| T | = Number of days in building |
| $W_B$ | = Maximum weight of poultry (lbs) |
| M | = Average mortality rate (%) |
| C | = Constant of one $ft^3$/lb of bird |
| F | = Safety factor |

A safety factor of 2.5 shall be used unless site specific records are available to document expected mortality rates.

**Swine.** Total bin area and volume requirements depend upon the size of the operation and expected mortality. Actual death loss data should be used in sizing composters for existing operations. For planning purposes and sizing composters for new operations, use the information in the following table. A minimum of 20 $ft^3$ of volume is needed in both primary and secondary bins per bound of carcass composted daily.

Square bins offer the best opportunity to reduce heat loss through the sides of the bins, although length to width ratios of up to 2:1 is acceptable. The width of bins should be based upon the width of the loader bucket used to work the compost. The bins should be at least 2 feet wider than the loader bucket. Excessively large bins should be avoided. Bins with 100 to 200 square feet of surface are work best.

Average Annual Death Loss for Swine in Confinement

| | Ave. Weight (lbs) | Annual Mortality (%) |
|---|---|---|
| Sow Herd[1] | 375 | 6 to 8 |
| Nursery[2] | 32 | 22 to 26 |
| Finishing | 150 | 10 to 12 |
| [1]Includes all mature animals, farrowing, gestating and boars. | | |
| [2]Includes losses in farrowing house prior to weaning. | | |

**CONSIDERATIONS**

**Location.** Locate dead animal composting facilities as near to the source of the animals as is practical. Consideration should be given to prevailing winds, vegetative screening and building arrangement to minimize odor and visual resource problems. The facility should be located so that runoff water can be diverted away form the facility. The composting facility shall be located above the 25 year floodplain. The following separation distances are required by the Indiana Department of Environmental Management for waste storage facilities. The same separation distances should be adhered to for composting facilities.

IDEM Separation Distances

| | |
|---|---|
| Public Roadway* | 50 ft. |
| Water Well | 100 ft. |
| Stream, Drainage Ditch or Body of Water* | 300 ft. |
| *Unless secondary containment is provided and approved by IDEM. | |

**Equipment and Facilities.** Dead animal composting requires that the compost be handled and monitored to optimize the composting

process. A probe type thermometer is generally used to monitor temperature.

The composting process occurs in two stages. Primary composting occurs upon initial loading of the compost bin. The second and final stage occurs after the pile is turned to aerate it. To achieve this two stage process, the facility should consist of at least two bins. Equipment should be available to turn the compost as needed.

Multiple bins or a large central secondary composting area will allow more flexibility in handling the compost. After the composting is complete the compost must be utilized or stored until it can be utilized. Many compost facilities incorporate a temporary storage area or secondary stage to contain the compost until conditions are suitable for spreading. The facility must either have facilities for temporary storage of the compost or the operation and maintenance plan shall address how the compost will be handled when conditions are not suitable for spreading.

**Composting Materials.** To optimize the composting process, materials must be available to provide:

(a) The proper carbon-nitrogen (C-N) ratio.

(b) A bulking agent for proper aeration of the compost pile.

(c) The proper moisture content.

The process will be most economical if on-farm or locally available materials are used for bulking agents and to achieve the proper carbon-nitrogen ratios. For poultry, typically litter (a combination of manure and bedding) from the floor of the housing units is alternated with layers of dead birds to provide the proper C-N ratio. This is often supplemented with straw to add bulk and provide aeration.

A typical compost mix for a broiler operation is:

Broiler Operation Compost Mix

| Ingredient | Volume (parts) | Weight (parts) |
|---|---|---|
| Straw | 1.0 | 0.1 |
| Broiler | 2.0 | 1.0 |
| Manure | 2.0 | 1.5 |
| Water | 0.5 | 0.75 |

For swine, the most effective composting agent to provide the correct C-N ration seems to be sawdust. However, other products such as ground corn stalks and chopped straw or hay have also been used successfully. Old compost can also be used, but some fresh material will need to be added to maintain the carbon supply. For swine, it appears to be important to use a friable material that will settle closely around the carcasses in the compost pile. If sawdust is used, 100 $ft^3$ of sawdust per 1000 lbs of carcasses is required on average. If the mortality of the herd is not known, an estimate of 1/3 to 1/2 $yd^3$ of sawdust per sow in a farrow to finish herd will be needed per year.

**PLANS AND SPECIFICATIONS**

Plans and specifications for the composting facility shall be in keeping with this standard and other applicable federal, state and local codes. The plans must show all features required for the proper installation and functioning of the practice including but not limited to: plan view, structure cross sections, drainage details, erosion and sediment controls, access, safety features, foundation requirements and nutrient management plan.

**Documents.** A composing facility shall not be reported as complete until adequate documentation, showing the proper installation is complete. The as-built drawings shall be signed and dated by the person with construction approval authority for the practice, to indicate the structure was constructed as designed except for any red lined changes shown on the plans. The design folder with the as-built plans and specifications shall be filed with the Waste

Management System plan in the conservation plan folder.

## OPERATION AND MAINTENANCE

A written operation and maintenance plan shall be provided to the owner/operator, which describes things he or she must do to operate and maintain the composting facility for its design life. As a minimum the plan must describe the actions necessary to maintain the structural integrity of the facility and to operate it in an environmentally sound manner.

The plan should detail the ratio of ingredients for a good compost mix, based upon the materials available on the farm for composting. A plan for monitoring the temperature of the compost should be explained. Failure to reach the maximum temperature may result in incomplete destruction of pathogens and weed seeds. The plan should explain how the compost will be turned or moved to a secondary storage when the temperature falls below 105 $^{o}$F. The plan should also provide details for the ultimate utilization of the composted materials and the expected rates for land application of the material. Land application rates should be based upon testing of the completed compost. If testing is not feasible, the estimated nutrient content of completed compost is listed in Chapter 4 of the Agricultural Waste Management Field Handbook.

**REFERENCES**

University of Missouri-Columbia, 1994, Composting Dead Swine, Extension Publication, WQ 225.